CLAIMS

We claim:

1. A thin film optical coating, having a layer comprising sol-gel derived niobium oxide, wherein the layer is capable of providing an index of refraction of at least about 1.90.

2. The coating in accordance with claim 1, wherein the niobium oxide layer is a low-temperature cured niobium oxide layer.

3. The coating in accordance with claim 1, wherein the layer comprising niobium oxide further comprises a second oxide selected from the group consisting of silicon dioxide and aluminum oxide, wherein the second oxide is present in the layer in a mole fraction of up to about 0.55 based on the total moles of niobium oxide and the second oxide in the layer.

4. A process for producing a thin film optical coating on a substrate, comprising:

(a) immersing the substrate in a mixture comprising niobium chloride and an alcohol;

(b) withdrawing the substrate from the mixture to provide the substrate with a coating of the mixture; and

(c) heat-treating the substrate to form a niobium oxide-based layer having an index of refraction of at least about 1.90.

5. The process according to claim 4, wherein the alcohol comprises ethanol.

6. The process according to claim 4, wherein the mixture further comprises one or more additional components selected from the group consisting of silicon precursors and aluminum precursors, wherein the one or more additional components are present in the mixture in a total mole fraction of up to about 0.55 based

on the total moles of the niobium chloride and the one or more additional components present in the mixture.

7. The process according to claim 4, wherein the mixture comprises niobium chloride in a concentration of from about 20 g/L to about 100 g/L.

8. The process according to claim 4, wherein the substrate is withdrawn at a speed of from about 2 mm/s to about 20 mm/s.

9. The process according to claim 4, wherein the heat-treating step is conducted at a temperature of up to about 200° C.

10. The process according to claim 9, wherein the layer has a thickness of from about 35 nanometers to about 150 nanometers subsequent to the heat-treating step.

11. A coated substrate having a thin film optical coating in accordance with claim 1, wherein the substrate has a melting point temperature greater than or equal to about 100°C.

12. A thin film optical coating, having a layer comprising a sol-gel derived oxide system, the sol-gel derived oxide system comprising niobium oxide, silicon dioxide and aluminum oxide, wherein the layer is capable of providing an index of refraction of from about 1.60 to about 1.90.

13. The coating in accordance with claim 12, wherein the niobium oxide is present in the layer in a mole fraction of from about 0.22 to about 0.53, the silicon oxide is present in the layer in a mole fraction of from about 0.29 to about 0.49, and the aluminum oxide is present in the layer in a mole fraction of from about 0.17 to about 0.29, each mole fraction being based on the total moles of niobium oxide, silicon oxide and aluminum oxide in the layer.

14. A process for producing a thin film optical coating on a substrate, comprising:

(a) immersing the substrate in a mixture comprising niobium chloride, a silicon precursor, an aluminum precursor, and an alcohol, wherein the molar ratio of niobium to silicon is from about 0.9:1 to about 3.6:1 and the molar ratio of niobium to aluminum is from about 0.8:1 to about 3.0:1;

(b) withdrawing the substrate from the mixture to provide the substrate with a coating of the mixture; and

(c) heat-treating the substrate to form a layer having an index of refraction of from about 1.60 to about 1.90.

15. The process according to claim 14, wherein the mixture comprises niobium chloride in a concentration of from about 20 g/L to about 35 g/L.

16. The process according to claim 14, wherein the substrate is withdrawn at a speed of from about 2 mm/s to about 20 mm/s.

17. The process according to claim 14, wherein the heat-treating step is conducted at a temperature of up to about 200° C.

18. The process according to claim 17, wherein the layer has a thickness of from about 35 nanometers to about 300 nanometers.

19. A coated substrate having a thin film optical coating in accordance with claim 12, wherein the substrate has a melting point temperature greater than or equal to about 100°C.

20. An optical filter comprising a thin film optical coating produced by the process of claim 14.

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